

Claims

- [c1] 1. A control apparatus that facilitates the operation of a component that is subjected to stress from a stress-inducing component, wherein the apparatus comprises: an operation sensing unit that senses when the component should be operated;
a stress reducing unit that provides a signal for reducing an amount of stress applied to the component from the stress-inducing component when the operating sensing unit senses that the component should be operated; and
a control unit that provides a signal for operating the component a predetermined time after the stress reducing unit provides the signal.
- [c2] 2. The apparatus according to claim 1 wherein the component comprises a bicycle transmission shifting device.
- [c3] 3. The apparatus according to claim 2 wherein the component comprises an internal bicycle transmission shifting device.
- [c4] 4. The apparatus according to claim 1 wherein the stress inducing component comprises a motion assisting unit that applies a motion assisting force to the component.

- [c5] 5. The apparatus according to claim 1 further comprising a condition sensing unit operatively coupled to the operation sensing unit, wherein the operation sensing unit senses when the component should be operated in response to the condition sensing unit.
- [c6] 6. The apparatus according to claim 5 wherein the condition sensing unit comprises a torque sensor.
- [c7] 7. The apparatus according to claim 6 wherein the torque sensor comprises a bicycle pedal torque sensor.
- [c8] 8. The apparatus according to claim 1 wherein the operation sensing unit comprises a running condition sensing unit that senses a running condition of a bicycle.
- [c9] 9. The apparatus according to claim 8 wherein the running condition comprises bicycle speed.
- [c10] 10. The apparatus according to claim 8 wherein the running condition comprises bicycle crank speed.
- [c11] 11. The apparatus according to claim 8 wherein the component comprises a bicycle transmission shifting device.
- [c12] 12. The apparatus according to claim 11 wherein the running condition sensing unit determines whether the

running condition has passed a shift threshold value.

[c13] 13. The apparatus according to claim 12 wherein the running condition sensing unit determines whether the running condition has passed a downshift threshold value.

[c14] 14. The apparatus according to claim 12 further comprising a bicycle condition sensing unit operatively coupled to the operation sensing unit, wherein the operation sensing unit senses when the bicycle transmission shifting device should be operated in response to the running condition sensing unit and the bicycle condition sensing unit.

[c15] 15. The apparatus according to claim 14 wherein the operation sensing unit determines that the bicycle transmission shifting device should be operated when the running condition passes a first shift threshold value and a bicycle condition passes a first condition threshold value in a first direction, and wherein the operation sensing unit determines that the bicycle transmission shifting device should be operated when the running condition passes a second shift threshold value different from the first shift threshold value and the bicycle condition passes a second condition threshold value in a second direction different from the first direction.

- [c16] 16. The apparatus according to claim 15 wherein the second direction is opposite the first direction.
- [c17] 17. The apparatus according to claim 16 wherein the bi-cycle condition sensing unit comprises a torque sensor.
- [c18] 18. The apparatus according to claim 17 wherein the bi-cycle condition sensing unit comprises a pedal torque sensor.
- [c19] 19. The apparatus according to claim 11 wherein the operation sensing unit senses the operation of a manual transmission control device to determine that the bicycle transmission shifting device should be operated.
- [c20] 20. The apparatus according to claim 11 wherein the transmission shifting device comprises a power storing device for storing operating power for the transmission shifting device.
- [c21] 21. The apparatus according to claim 1 wherein the stress inducing component comprises an electrically operated stress inducing component, and wherein the stress reducing unit provides a signal for reducing an amount of electrical operating power to the stress-inducing component when the component should be operated.

